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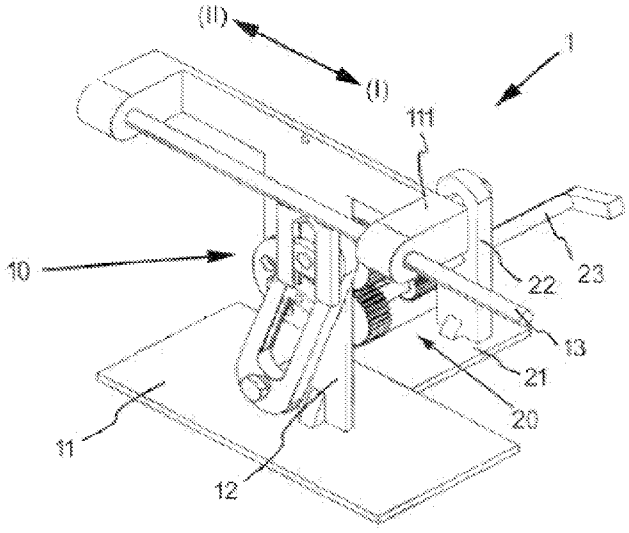

Figure 1

(57) Abstract: The present invention relates to an electricity generation system (1) for generating electrical energy by using wave energy; and associated with at least one float which floats in water which can realize free rise/fall movement depending on wave movement on the water surface by means of at least one input shaft (13), and associated with at least one alternator which can generate electrical energy from movement transferred by means of at least one output shaft (23). The improvement of the invention is that the subject matter electricity generation system (1) comprises at least one fast rotation mechanism (10) for transforming the free rise/fall movement of said float into rotational movement, and at least one gear mechanism (20) for transferring the movement, which is in forward direction (I) or backward direction (II) and which is received from said fast rotation mechanism (10), to said alternator in a unidirectional form.

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ELECTRICITY GENERATION SYSTEM

TECHNICAL FIELD

The present invention relates to an electricity generation system for generating electrical energy by using wave energy; and associated with at least one float which floats in water which can realize free rise/fall movement depending on wave movement on the water surface by means of at least one input shaft, and associated with at least one alternator which can generate electrical energy from movement transferred by means of at least one output shaft.

PRIOR ART

As coal, petroleum, natural gas and other fossil energy sources decrease and as prices increase, obtaining power needed for lives of people and for industrialization becomes difficult every passing day. At the same time, generation of electricity by using coal, petroleum, natural gas, etc. leads to pollution of the atmosphere and environment. Because of this, global warming increases. Therefore, people tend to use renewable energy like wind, solar, tidal and wave energy for electricity generation.

In the present art, generation of electrical energy by using wave energy is realized by means of various methods. However, in the present electricity generation systems using wave energy, wave dimension is desired to be high. Because of this, transformation process cannot be realized as efficiently as desired at small waves. At the same time, electrical energy generation cannot be realized efficiently because the float or pontoon speed in free rise while the waves are coming depending on wave movement and the float or pontoon speed in free lowering as a result of gravity after the waves come.

The application with no 2008/04582 known in the art relates to a system which provides transformation of hydro-mechanical energy (wave energy), included by waves occurring in open water, into electrical energy and a method realized by said system. Electrical energy generation is realized by rising of floats, which float on water, by the buoyancy of water as a result of facing with waves which move on water surface, and by descending of the floats downwardly as a result of gravity as the waves leave the section where the floats exist after said waves advance in water surface. Movement of floats is transferred to the main drive

shaft as angular movement by means of mechanical connections. By means of this, the rotational force needed for generation of electrical energy is obtained.

As a result, because of the abovementioned problems, an improvement is required in the related technical field.

BRIEF DESCRIPTION OF THE INVENTION

The present invention relates to an electrical energy generation system by using wave energy, for eliminating the abovementioned disadvantages and for bringing new advantages to the related technical field.

An object of the present invention is to provide an electrical energy generation system which operates with high efficiency by utilizing wave energy.

Another object of the present invention is to provide an electricity generation system embodied such that float speed, which exists in free rise while the waves are coming, and the float speed, which exists in free descending as a result of gravity after the waves come, are equal to each other at alternator output.

Another object of the present invention is to provide an electricity generation system which can operate at small wave sizes.

Another object of the present invention is to provide an electricity generation system which realizes bidirectional rotational movement while the floats are rising as a result of waves and while the floats are descending after the waves.

Another object of the present invention is to provide an electricity generation system where bidirectional rotational movement which occurs while the floats are rising as a result of waves and while the floats are descending after the waves is transformed into unidirectional rotational movement for more efficient operation of alternator.

In order to realize the abovementioned objects and the objects which are to be deducted from the detailed description below, the present invention is an electricity generation system for generating electrical energy by using wave energy; and associated with at least one float which floats in water which can realize free rise/descend movement depending on wave movement on the water surface by means of at least one input shaft, and associated with at

least one alternator which can generate electrical energy from movement transferred by means of at least one output shaft. Accordingly, the improvement is that the subject matter electricity generation system comprises at least one fast rotation mechanism for transforming the free rise/fall movement of said float into rotational movement, and at least one gear mechanism for transferring the movement, which is in forward direction or backward direction and which is received from said fast rotation mechanism, to said alternator in a unidirectional form. Thus, electrical energy is generated even at small wave dimensions. At the same time, by means of free rising/falling movement of the float as the wave approaches and after the wave moves away, electrical energy is generated from wave energy.

In a possible embodiment of the present invention, in order to transfer the movement received from said input shaft and which is in forward direction or in backward direction, the subject matter electricity generation system comprises at least one first bearing associated with the input shaft, at least one second bearing connected to said first bearing by means of at least one first sliding element and which can realize at least partially rotational movement by means of at least one second pin, and at least one rotary element connected to said second bearing by means of at least one second sliding element and by means of at least one arm and which provides transforming at least partially linear movement of the input shaft in forward direction or in backward direction into rotational movement. Thus, wave movement is transformed into rotational movement. By means of this, electrical energy is generated by means of rotational movement.

In another possible embodiment of the present invention, the gear mechanism comprises at least one first gear system and at least one second gear system in order to transform the bidirectional movement of the input shaft, connected to the float, which is in the forward direction or in the backward direction into unidirectional movement. Thus, uninterrupted electrical energy is generated in the free rising/falling movement of the float depending on wave movement.

In another possible embodiment of the present invention, said first gear system comprises at least one first big gear and at least one second big gear, which are connected to each other. Thus, electrical energy is generated in both conditions depending on free rising and falling movement of the float for generating electrical energy.

In another possible embodiment of the present invention, said second gear system respectively comprises at least one first pinion gear, at least one idle gear for changing direction, and at least one second pinion gear, which are connected to each other. Thus,

electrical energy is generated in both conditions depending on free rising and falling movement of the float for generating electrical energy.

In another possible embodiment of the present invention, in order to transfer the rotational movement, received from said rotary element, to the first gear system or to the second gear system, said first big gear and said first pinion gear are connected to at least one first bearing shaft. Thus, the rotational movement taken from linear wave movement is transferred to the gear system, and electrical energy is generated.

In another possible embodiment of the present invention, in order to transfer the rotational movement, received from the first gear system or from the second gear system, to the alternator, said second big gear and said second pinion gear are connected to at least one output shaft. Thus, rotational movement is transferred to the alternator by means of output shaft, and electrical energy is generated.

In another possible embodiment of the present invention, in order to transform the bidirectional movement of the input shaft, connected to the float, which is in the forward direction or in the backward direction into unidirectional movement, at least one first unidirectional bearing is positioned between said first big gear and said first bearing shaft. Thus, unidirectional rotational movement needed for generation of electrical energy in the alternator is generated. By means of this, electrical energy is generated in a continuous and uninterrupted manner depending on wave movement.

In another possible embodiment of the present invention, in order to transform the bidirectional movement of the input shaft, connected to the float, which is in the forward direction or in the backward direction into unidirectional movement, at least one second unidirectional bearing is positioned between the first pinion gear and the first bearing shaft. Thus, unidirectional rotational movement needed for generation of electrical energy in the alternator is generated. By means of this, electrical energy is generated in a continuous and uninterrupted manner depending on wave movement.

In another possible embodiment of the present invention, said first unidirectional bearing and said second unidirectional bearing are configured to rotate in opposite directions with respect to each other. Thus, a single gear system is active as the wave approaches and after the wave moves away. By means of this, electrical energy is generated in both conditions.

In another possible embodiment of the present invention, in order to provide bedding of said idle gear used for changing direction, at least one second bearing shaft is provided which is positioned on the idle gear and which is connected to at least one second foot. Thus, the idle gear used for changing direction is fixed.

In another possible embodiment of the present invention, at least one centering element is provided for positioning of the input shaft on at least one first foot. Thus, movement of the input shaft is transferred to the fast rotation mechanism. At the same time, the input shaft moves in a firm linear manner.

BRIEF DESCRIPTION OF THE FIGURES

In Figure 1, a representative perspective view of the subject matter electricity generation system is given.

In Figure 2, a representative frontal view of the subject matter electricity generation system is given.

In Figure 3, a representative lateral view of the subject matter electricity generation system is given.

In Figure 4, a representative lateral view of the gear mechanism of the subject matter electricity generation system is given.

In Figure 5, a representative perspective view of the upper part of the gear mechanism of the subject matter electricity generation system is given.

DETAILED DESCRIPTION OF THE INVENTION

In this detailed description, the subject matter is explained with references to examples without forming any restrictive effect only in order to make the subject more understandable.

In Figure 1, a representative perspective view of the subject matter electricity generation system (1) is given. Accordingly, said electricity generation system (1) is used for generating electrical energy by means of bidirectional movement of waves. Accordingly, there is at least one float (not illustrated in the figures) which moves together with the waves during bidirectional movement of waves. Said float moves linearly together with the waves. The

electricity generation system (1) comprises at least one fast rotation mechanism (10). Said fast rotation mechanism (10) is positioned on at least one foot (12) connected to at least one first floor (11). There is at least one input shaft (13) connected to the float. Said input shaft (13) is bedded with at least one centering element (111) positioned at the upper side of the first foot (12). The input shaft (13) moves linearly in the forward direction (I) or in the backward direction (II) depending on the movement of waves. The fast rotation mechanism (10) transforms the linear movement of the input shaft (13) into rotational movement depending on wave movement. The electrical generation system (1) comprises at least one gear mechanism (20). Said gear mechanism (20) is positioned on at least one second foot (22) connected to at least one second floor (21). There is at least one output shaft (23) connected to the gear mechanism (20) and to said second foot (22). Said output shaft (23) is connected to at least one alternator (not illustrated in the figures) for transforming rotational movement thereof into electrical energy. Thanks to the gear mechanism (20); the output shaft (23) realizes rotational movement only in one direction in the rising movement of the floats as a result of wave and in the descending of the floats after the wave as a result of gravity. Thus, the alternator is rotated only in one direction by means of the output shaft (23), and electrical energy is generated.

In Figure 2, a representative frontal view of the subject matter electricity generation system (1) is given. Accordingly, at least one first bearing (14) is fixed onto the input shaft (13). At least one first sliding element (141), which can realize sliding movement, is positioned in said first bearing (14). Said first sliding element (141) is connected to at least one second bearing (15) by means of at least one first pin (142). Said second bearing (15) is connected in a rotatable manner to at least one second pin (152) associated with the first foot (12). By means of this, while the first sliding element (141) realizes sliding movement in the first bearing (14) during linear movement of the input shaft (13), the second bearing (15) moves in the direction where the input shaft (13) moves. At least one second sliding element (151), which can realize sliding movement, is positioned in the second bearing (15). Said second sliding element (151) is connected to at least one third pin (1611) associated with at least one arm (161). Said arm (161) is connected to at least one rotary element (16) by means of at least one fourth pin (162). Thus, during the movement of the second bearing (15) dependent on the input shaft (13), the second sliding element (151) realizes sliding movement in the second bearing (15). The second sliding element (151) is connected to said rotary element (16) by means of the arm (161) and provides actuation of the rotary element (16). During linear movement of the input shaft (13), the first sliding element (141) realizes sliding movement in the first bearing (14). Thus, the second bearing (15) has an angular movement which is in the same direction with the input shaft (13). During movement of the

second bearing (15), the second sliding element (151), connected to the arm (161), realizes sliding movement in the second bearing (15). Thus, the arm (161), connected to the second sliding element (151), provides movement of the rotary element (16) with angular speed. As a result, the linear movement realized by the input shaft (13) by means of the effect of the wave is transformed into rotational movement.

In accordance with basic physics information, the float, which rises freely as a result of wave impact, decelerates in a proportional manner with the rising duration. Float, which descends freely as a result of gravitational acceleration after the wave, accelerates in a proportional manner with the descending duration. However, for providing more efficient electrical energy generation, the output shaft (23), connected to the alternator, has to move with equal speed as much as possible. At the same time, angular speed of the second bearing (15) changes because of the basic principle of the fast rotation mechanism (10). The reason for this is that the distance with respect to the second pin (152), in other words with respect to the support continuously changes during movement of the second bearing (15). Therefore, the approaching movement of the second bearing (15) to the second pin (152) takes place in more rapid manner depending on the input shaft (13), and the diverging movement from the second pin (152) takes place in a slower manner. Therefore, in order to obtain electrical energy in a more efficient manner, the direction of the float, which moves slowly as the wave approaches, is selected as the fast direction in the fast rotation mechanism (10), and the direction of the float, which moves fast as the wave moves away, is selected as the slow direction in the fast rotation mechanism (10). By means of this, in the electricity generation system (1), the output shaft (23), connected to the alternator, is continuously moved with equal speed.

In Figure 3, a representative lateral view of the subject matter electricity generation system (1) is given. Accordingly, linear movement of the input shaft (13) is transformed into rotational movement by means of the fast rotation mechanism (10). The rotary element (16) is connected to at least one first bearing shaft (24). Thus, linear movement of the input shaft (13) is transferred to said first bearing shaft (24) by means of the rotary element (16). By means of this, the first bearing shaft (24) realizes rotational movement in the direction where the rotary element (16) moves. The gear mechanism (20) of the electricity generation system (1) comprises at least one first gear system (25) and at least one second gear system (26). The first bearing shaft (24) is connected to said first gear system (25) and to said second gear system (26). The first gear system (25) and the second gear system (26) are connected to the output shaft (23). Thus, linear wave movement is transformed into rotational movement. By means of this, rotational movement is transformed into electrical energy by

means of the alternator connected to the output shaft (23). At least one second bearing shaft (27) is positioned on the second foot (22). Said second bearing shaft (27) is connected to the second gear system (26).

In Figure 4, a representative lateral view of the gear mechanism (20) of the subject matter electricity generation system (1) is given. Accordingly, the gear mechanism (20) comprises the first gear system (25) and the second gear system (26). The first gear system (25) comprises two gears, and the second gear system (26) comprises three gears. The first gear system (25) comprises at least one first big gear (251) and at least one second big gear (252), which are connected to each other. Said first big gear (251) and said second big gear (252) are connected such that they rotate in opposite directions with respect to each other. The second big gear (252) is connected to the output shaft (23) by means of roller bearing (not illustrated in the figures). In a possible embodiment of the present invention, said roller bearing is ball bearing. Thus, rotational movement of the first bearing shaft (24) is transferred to the output shaft (23). The second gear system (26) comprises at least one first pinion gear (261), at least one second pinion gear (263) and at least one idle gear (262) positioned in between. Said first pinion gear (261) and said idle gear (262) are connected to each other and move in opposite directions. The idle gear (262) is connected to the second bearing shaft (27). The idle gear (262) and said second pinion gear (263) are connected to each other and move in opposite directions. Rotational movement of the idle gear (262) is used for changing of direction. The second pinion gear (263) is connected to the output shaft (23) and the idle gear (262) is connected to the second bearing shaft (27) by means of roller bearing (not illustrated in the figures). In a possible embodiment of the present invention, said roller bearing is ball bearing. By means of this, rotational movement of the first bearing shaft (24) is transferred to the output shaft (23).

In Figure 5, a representative perspective view of the upper part of the gear mechanism (20) of the subject matter electricity generation system (1) is given. Accordingly, the first big gear (251) and the first bearing shaft (24) are connected with at least one first unidirectional bearing (28). The first pinion gear (261) and the first bearing shaft (24) are connected with at least one second unidirectional bearing (29). The first gear system (25) and the second gear system (26) force the output shaft (23) to rotate in opposite directions with respect to each other. By means of said first unidirectional bearing (28) and said second unidirectional bearing (29), the difference in rotational movement transferred by the first gear system (25) and the second gear system (26) is prevented. Thanks to this, by means of opposite directional linear wave movement, an only one-directional rotational movement is obtained on the output shaft (23). Thus, high efficiency and uninterrupted electrical energy is

generated by rotating the alternator only in one direction. In accordance with a possible embodiment of the present invention, the first unidirectional bearing (28) and the second unidirectional bearing (29) are ball bearings which allow rotation in only one direction. The first unidirectional bearing (28) and the second unidirectional bearing (29) comprise ball bearings which rotate in opposite directions. By means of this, the output shaft (23) rotates in one direction for realizing power generation in an independent manner from the rotation of the first bearing shaft (24) in clockwise or counter-clockwise direction.

In accordance with a possible embodiment of the invention, the subject matter electricity generation system (1) operates as follows: While the float rises in case of wave impact, float descends after the wave. Thus, the input shaft (13) connected to the float can move linearly in opposite direction. In the backward (II) movement depending on the wave movement of the input shaft (13), the second bearing (15) moves in the counter-clockwise direction by means of the first sliding element (141). In the movement of the second bearing (15) in the counter-clockwise direction, the rotary element (16) moves in the counter-clockwise direction by means of the second sliding element (151) and by means of the arm (161). By means of this, the first bearing shaft (24), connected to the rotary element (16), also rotates in the counter-clockwise direction. Thus, electrical energy can be generated by utilizing float movement even in case of a small wave. The first unidirectional bearing (28) has ability to rotate in the counter-clockwise direction. In this case, the first unidirectional bearing (28) and the first gear system (25) are passive. When the first bearing shaft (24) moves in counter-clockwise direction, locking process does not take place since the first unidirectional bearing (28) has ability to rotate in the counter-clockwise direction. The second unidirectional bearing (29) has ability to rotate in the clockwise direction. In this case, the second unidirectional bearing (29) and the second gear system (26) are active. By means of this, the movement received from the input shaft (13) is transferred to the output shaft (23) by means of the second gear system (26). When the first bearing (14) shaft moves in counter-clockwise direction, locking process takes place since the second unidirectional bearing (29) has ability to rotate in the clockwise direction. By means of this, the first pinion gear (261) moves in the counter-clockwise direction. Since idle gear (262) in the second gear system (26) is used only for changing direction, the second pinion gear (263) moves in the counter-clockwise direction. Thus, the output shaft (23) moves in the counter-clockwise direction.

In the movement of the input shaft (13) in the forward direction (I) depending on wave movement, the second bearing (15) moves in the clockwise direction by means of the first sliding element (141). In the movement of the second bearing (15) in the clockwise direction, the rotary element (16) moves in the clockwise direction by means of the second sliding

element (151) and by means of the arm (161). By means of this, the first bearing shaft (24) connected to the rotary element (16) also moves in the clockwise direction. The second unidirectional bearing (29) has ability to rotate in the clockwise direction. In this case, the second unidirectional bearing (29) and the second gear system (26) are passive. When the first bearing shaft (24) moves in the clockwise direction, locking process does not take place because the second unidirectional bearing (29) has ability to rotate in clockwise direction. Therefore, no power transfer occurs from the first pinion gear (261) to the output shaft (23). The first unidirectional bearing (28) has ability to rotate in the counter-clockwise direction. In this case, the first unidirectional bearing (28) and the first gear system (25) are active. By means of this, the movement received from the input shaft (13) is transferred to the output shaft (23) by means of the first gear system (25). When the first bearing shaft (24) moves in the clockwise direction, locking process takes place because the first unidirectional bearing (28) has ability to rotate in the counter-clockwise direction. By means of this, the first big gear (251) also moves in the clockwise direction. By means of this, the second big gear (252) moves in the counter-clockwise direction. Thus, the output shaft (23) moves in the counter-clockwise direction. By means of this, in the movement of the input shaft (13) in the forward direction (I) or in the backward direction (II) depending on wave movement, the output shaft (23) is moved only in one direction in the movement of the first bearing shaft (24) in clockwise or counter-clockwise direction. Thus, alternator output is rotated in a single direction during wave impact and after wave impact, and electrical energy is obtained with high efficiency.

In a possible embodiment of the invention, if the output shaft (23), in other words, alternator output is desired to be rotated in clockwise direction, the first unidirectional bearing (28) comprises ball bearing which has ability to rotate in clockwise direction and the second unidirectional bearing (29) comprises ball bearing which has ability to rotate in counter-clockwise direction. Thus, in the backward directional (II) movement of the input shaft (13) depending on wave movement, while the first bearing shaft (24) moves in the counter-clockwise direction, a force which shall rotate the output shaft (23) does not occur because the second unidirectional bearing (29) also has ability to rotate in counter-clockwise direction. Thus, the second pinion gear (263) and the second unidirectional bearing (29) stay in the passive state. However, while the first bearing shaft (24) moves in counter-clockwise direction, locking process is active because the first unidirectional bearing (28) has ability to rotate in clockwise direction. By means of this, while the first big gear (251) moves in counter-clockwise direction, the second big gear (252) moves in clockwise direction. Thus, since a force which shall rotate the output shaft (23) occurs, the output shaft (23) moves in clockwise direction.

In the movement of the input shaft (13) in the forward direction (I) depending on wave movement, while the first bearing shaft (24) moves in clockwise direction, a force which rotates the output shaft (23) does not occur because the first unidirectional bearing (28) also has ability to rotate in clockwise direction. Thus, the first big gear (251) and the first unidirectional bearing (28) stay in passive state. However, while the first bearing shaft (24) moves in clockwise direction, since the second unidirectional bearing (29) has ability to rotate in the counter-clockwise direction, locking process is active. By means of this, the first pinion gear (261) moves in the clockwise direction. Since the idle gear (262) in the second gear system (26) is used only for changing direction, the second pinion gear (263) also moves in clockwise direction. Thus, the output shaft (23) moves in the clockwise direction. Thus, alternator output is rotated in a single direction during wave impact and after wave impact, and electrical energy is obtained with high efficiency.

In accordance with these explanations, the subject matter electricity generation system (1) comprises the fast rotation mechanism (10) and the gear mechanism (20). By means of the fast rotation mechanism (10), the speeds of the float, which are different from each other and which occur in free rise as a result of wave impact and in free fall as a result of gravity acceleration, are transferred to the output shaft (23) in an equal manner. At the same time, even by means of a small wave movement, electrical energy can be generated in an uninterrupted manner. As the float rises while the wave is approaching or the float descends while the wave is moving away depending on the small or big wave movement by means of the gear mechanism (20), the output shaft (23), connected to the alternator, is rotated in a single direction, and electrical energy is generated with high efficiency.

The protection scope of the present invention is set forth in the annexed claims and cannot be restricted to the illustrative disclosures given above, under the detailed description. It is because a person skilled in the relevant art can obviously produce similar embodiments under the light of the foregoing disclosures, without departing from the main principles of the present invention.

REFERENCE NUMBERS

1 Electricity generation system

10 Fast rotation mechanism
11 First floor
111 Centering element
12 First foot
13 Input shaft
14 First bearing
141 First sliding element
142 First pin
15 Second bearing
151 Second sliding element
152 Second pin
16 Rotary element
161 Arm
1611 Third pin
162 Fourth pin

20 Gear mechanism
21 Second floor
22 Second foot
23 Output shaft
24 First bearing shaft
25 First gear system
251 First big gear
252 Second big gear
26 Second gear system
261 First pinion gear
262 Idle gear
263 Second pinion gear
27 Second bearing shaft
28 First unidirectional bearing
29 Second unidirectional bearing
(I) Forward direction
(II) Backward direction

CLAIMS

1. The present invention is an electricity generation system (1) for generating electrical energy by using wave energy; and associated with at least one float which floats in water which can realize free rise/fall movement depending on wave movement on the water surface by means of at least one input shaft (13), and associated with at least one alternator which can generate electrical energy from movement transferred by means of at least one output shaft (23), **wherein** the subject matter electricity generation system (1) comprises at least one fast rotation mechanism (10) for transforming the free rise/fall movement of said float into rotational movement, and at least one gear mechanism (20) for transferring the movement, which is in forward direction (I) or backward direction (II) and which is received from said fast rotation mechanism (10), to said alternator in a unidirectional form.

2. The electricity generation system (1) according to claim 1, **wherein** in order to transfer the movement received from said input shaft (13) and which is in forward direction (I) or in backward direction (II), the subject matter electricity generation system (1) comprises at least one first bearing (14) associated with the input shaft (13), at least one second bearing (15) connected to said first bearing (14) by means of at least one first sliding element (141) and which can realize at least partially rotational movement by means of at least one second pin (152), and at least one rotary element (16) connected to said second bearing (15) by means of at least one second sliding element (151) and by means of at least one arm (161) and which provides transforming at least partially linear movement of the input shaft (13) in forward direction (I) or in backward direction (II) into rotational movement.

3. The electricity generation system (1) according to claim 1, **wherein** the gear mechanism (20) comprises at least one first gear system (25) and at least one second gear system (26) in order to transform the bidirectional movement of the input shaft (13), connected to the float, which is in the forward direction (I) or in the backward direction (II) into unidirectional movement.

4. The electricity generation system (1) according to claim 3, **wherein** said first gear system (25) comprises at least one first big gear (251) and at least one second big gear (252), which are connected to each other.

5. The electricity generation system (1) according to claim 3, **wherein** said second gear system (26) respectively comprises at least one first pinion gear (261), at least one idle gear (262) for changing direction, and at least one second pinion gear (263), which are connected to each other.

6. The electricity generation system (1) according to claim 2 or 3 or 4 or 5, **wherein** in order to transfer the rotational movement, received from said rotary element (16), to the first gear system (25) or to the second gear system (26), said first big gear (251) and said first pinion gear (261) are connected to at least one first bearing shaft (24).

7. The electricity generation system (1) according to claim 3 or 4 or 5, **wherein** in order to transfer the rotational movement, received from the first gear system (25) or from the second gear system (26), to the alternator, said second big gear (252) and said second pinion gear (263) are connected to at least one output shaft (23).

8. The electricity generation system (1) according to claim 4 or 6, **wherein** in order to transform the bidirectional movement of the input shaft (13), connected to the float, which is in the forward direction (I) or in the backward direction (II) into unidirectional movement, at least one first unidirectional bearing (28) is positioned between said first big gear (251) and said first bearing shaft (24).

9. The electricity generation system (1) according to claim 5 or 6, **wherein** in order to transform the bidirectional movement of the input shaft (13), connected to the float, which is in the forward direction (I) or in the backward direction (II) into unidirectional movement, at least one second unidirectional bearing (29) is positioned between the first pinion gear (261) and the first bearing shaft (24).

10. The electricity generation system (1) according to claim 8 or 9, **wherein** said first unidirectional bearing (28) and said second unidirectional bearing (29) are configured to rotate in opposite directions with respect to each other.

11. The electricity generation system (1) according to claim 5, **wherein** in order to provide bedding of said idle gear (262) used for changing direction, at least one second bearing shaft (27) is provided which is positioned on the idle gear (262) and which is connected to at least one second foot (22).

12. The electricity generation system (1) according to claim 1, **wherein** at least one centering element (111) is provided for positioning of the input shaft (13) on at least one first foot (12).

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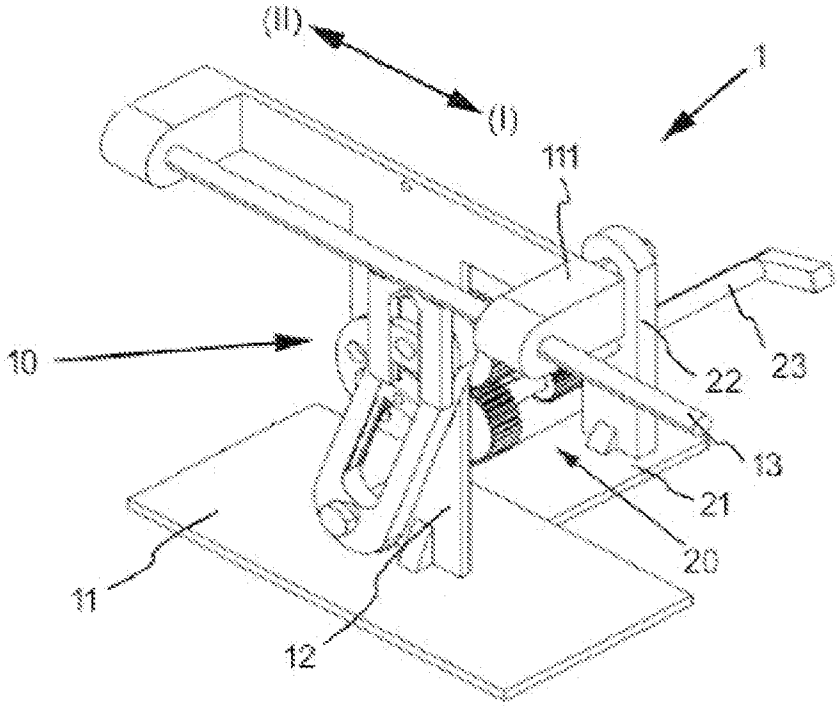

Figure 1

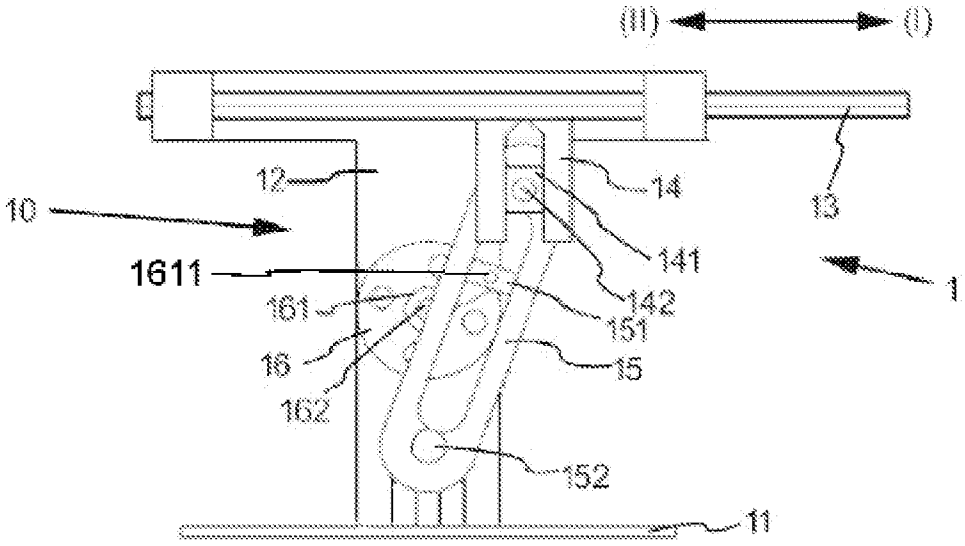

Figure 2

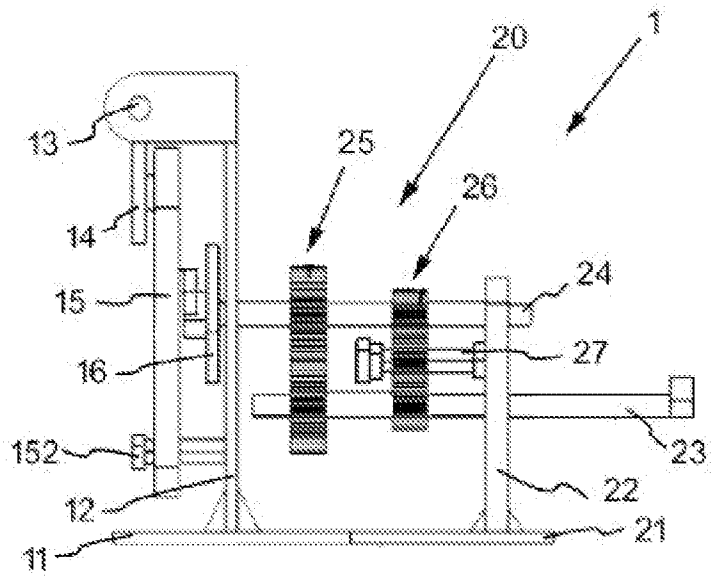

Figure 3

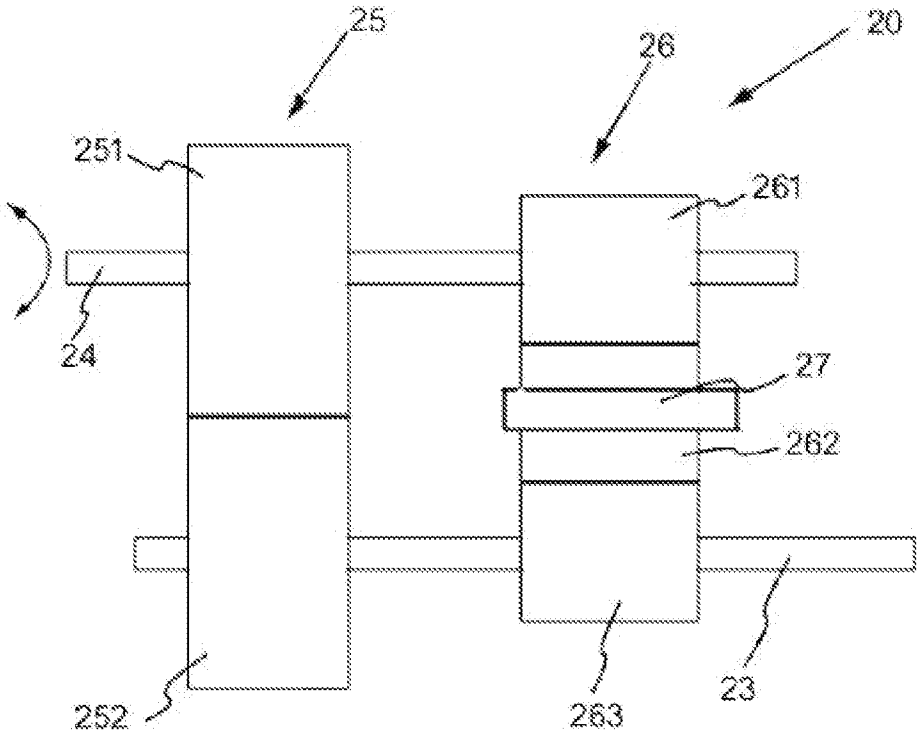

Figure 4

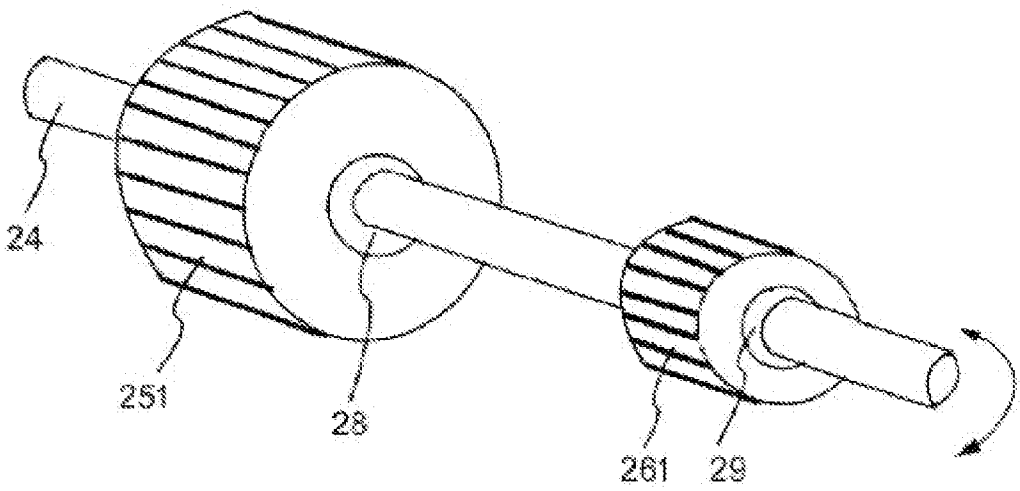

Figure 5

INTERNATIONAL SEARCH REPORT

International application No
PCT/TR2022/051341

A. CLASSIFICATION OF SUBJECT MATTER
INV. F16H37/12 F03B13/16
ADD. F16H3/00 F16H21/44

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
F16H F03B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2022/003201 A1 (DRAGIC MILE [RS]) 6 January 2022 (2022-01-06)	1,3-5
A	figures 13,15,15a, 15b, 15c	2,6-12
A	Osnabrück Hochschule: "Maschinendynamik Wintersemaester 1998/1999", , 31 December 1999 (1999-12-31), pages 1-11, XP93051915, Retrieved from the Internet: URL:https://www.hs-osnabrueck.de/fileadmin/HSOS/Homepages/Personalhomepages/Personalhomepages-IuI/Prediger/MD_Aufgaben_1_2_Satz_Euler.pdf [retrieved on 2023-06-05] page 9	1-12

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
6 June 2023	14/06/2023

Name and mailing address of the ISA/	Authorized officer
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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/TR2022/051341

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2022003201 A1	06-01-2022	US 2010043425 A1	25-02-2010
		US 2015211478 A1	30-07-2015
		US 2019249642 A1	15-08-2019
		US 2022003201 A1	06-01-2022